

**REMARKS**

Claims 1-10 are all the claims currently pending in this Application.

**Request for Signed and Initialed PTO Form**

Applicants note that the Examiner has again failed to provide Applicants with a signed and initialed copy of the PTO form submitted with the National Stage Entry on July 14, 2005. The Examiner previously indicated that the references listed therein were not provided by the International Bureau. Therefore, Applicants submitted additional copies, along with English Abstracts on November 6, 2007.

Applicants request that the Examiner consider the references listed on this form and provide Applicants with a signed and initialed copy.

**Prior Art Rejections**

Applicants respectfully traverse the prior art rejections as follows.

**Claim 1 — Robinson.** Claim 1 is rejected under 35 U.S.C. § 102(e) as allegedly anticipated by Robinson (U.S. Patent 6,768,822). Applicants submit that Robinson fails to disclose at least: “dispersion varying means for making variable the absolute value of the chromatic dispersion and for making variable the sign of chromatic dispersion, independent of the absolute value of the chromatic dispersion, given to said optical pulse in said waveguide.”

At page 3 of the Office Action, the Examiner incorrectly equates linear dispersion with “an absolute value of the chromatic dispersion” and dispersion slope with “a sign of chromatic dispersion”.

Correctly, the “linear dispersion” of Robinson corresponds to “a chromatic dispersion of the minimal order” as discussed, for example with respect to the second order of Figure 7 of the

present application; and the “dispersion slope” of Robinson corresponds to a “chromatic dispersion of a higher order” as discussed for example with respect to the third order of Figure 7 of the present application.

In col. 2, lines 48-57 of Robinson, it is described that (regardless of a plus or minus sign, each of the “linear dispersion” or the “dispersion slope” can be compensated, but there is no disclosure that an absolute value or a sign is made variable. The embodiment disclosed in Figure 1 of Robinson only makes variable the absolute value of the chromatic dispersion.

Additionally, in Robinson, a fiber grating, which is a reflection type waveguide, is used. The chromatic dispersion is changed by means of optical switches 3 and 4. At switch 3, by selecting one of the fiber gratings Q1 to Q5, the dispersion slope is *discontinuously* changed. Likewise, at switch 4, by selecting one of L1 to L5, the linear dispersion is discontinuously changed. During the process of changing the connection from one fiber grating to another, the connection is cut, so that an optical signal is not transmitted, but is dropped off. This may be a serious problem when considering an application to optical communications.

In contrast, in the present invention, a transmission type waveguide is used. The absolute value and sign of the chromatic dispersion can be continuously changed by changing a status of the waveguide. the waveguide itself that is used does not change (there is no switching from one waveguide to another), thus there are no problems that might stem from changing a waveguide.

In view of at least the above, Applicants submit that claim 1 is patentable over Robinson.

**Claim 1 — Riant.** Claim 1 is rejected under 35 U.S.C. § 102(e) as allegedly anticipated by Riant (U.S. Publication 2003/0035625). Applicants submit that Riant fails to disclose at least: “dispersion varying means for making variable the absolute value of the chromatic dispersion

and for making variable the sign of chromatic dispersion, independent of the absolute value of the chromatic dispersion, given to said optical pulse in said waveguide.”

In Riant, a chromatic dispersion compensation element using a Bragg grating is disclosed. The Bragg grating is a transmission type waveguide in which incident light is reflected and the proceeds on a reflected path. In Figure 1 of Riant, incident light entering form a port  $P_2$  is reflected by a Bragg grating 1, which is connected to a port  $P_2$  of a circulator 4. In order to change a sign of the linear dispersion and the dispersion slope, it is necessary to connected different waveguides such as the Bragg grating 1 and a Bragg grating 2 via respectively different ports of the circulator. Between the respective different ports and the Bragg gratings, a light loss occurs due to the connections. if the number of waveguides increases, the light loss increases since the number of ports which are connected increase. at the same time, the complexity and size of the apparatus increases.

On the other hand, in the present invention, by connecting, in series, areas of a waveguide having different chromatic dispersion characteristics, it is possible to constitute a compact element by which the absolute value and sign of the chromatic dispersion can be independently variable without increasing light loss.

In view of at least the above, Applicants submit that claim 1 is patentable over Riant.

**Claims 2-6 — Robinson, Riant, and Lee.** Claims 2-6 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Robinson in view of Lee (U.S. Patent 6,931,189); and also under 35 U.S.C. § 103(a) as allegedly unpatentable over Riant in view of Lee.

The Examiner asserts that Robinson and Riant only differ form the invention as recited in claim 2 in that they do not disclose “two materials having different dielectric constants

alternately and periodically in a direction in which said waveguide continues and a plurality of regions different in combination of the size and the interval of one said material existing in the other said material are arranged along a direction in which said waveguide continues.” The Examiner asserts that Lee teaches this feature.

However, in addition to the above-discussed deficiencies of Robinson and Riant, Applicants submit the following regarding Lee.

In Lee a constitution of the photonic crystal of the incident edge and the output edge of the waveguide is considered in order to decrease the connection loss between the optical fiber and the waveguide. In order to decrease loss, a state of light (called a “branch” in the present invention) existing in the waveguide must be single. the state of light existing in the waveguide of Lee being single can be confirmed in Figure 7 of Lee such that the refractive index characteristic curve relative to a line-defect waveguide is single.

On the other hand, in the present application, it is not possible to make the absolute value and the sign of the chromatic dispersion independently variable unless two branches, whose sign of the chromatic dispersion is different, exist in the waveguide. That is, in order to make the absolute value and the sign of the chromatic dispersion independently variable, a constitution of the waveguide needs to be newly designed so that the signs of the chromatic dispersions of the two branches are opposite.

Accordingly, by the invention of Lee, in which the status existing in the waveguide is single, only a constitution of an element, which only manes the absolute value of the chromatic dispersion variable, is estimate. Therefore it is not possible to estimate the constitution of the present application by combining Robinson or Riant with Lee.

Therefore, Applicants submit that claims 2-6 are patentable over the above-cited combinations of references.

**Claims 7-10 — Robinson, Riant, Lee, Hosomi, and Ido.** Claim 7 is rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Robinson in view of Lee and Hosomi (U.S. Patent 6,731,846); and also under 35 U.S.C. § 103(a) as allegedly unpatentable over Riant in view of Lee and Hosomi. Claims 8-10 are rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over Robinson in view of Lee, Hosomi, and Ido (U.S. Patent 5,570,439); and also under 35 U.S.C. § 103(a) as allegedly unpatentable over Riant in view of Lee, Hosomi, and Ido.

Applicants submit that neither Hosomi nor Ido remedy the above-discussed deficiencies of Robinson, Riant, and Lee. Therefore, Applicants submit that claims 1-9 are patentable at least by virtue of their dependencies and claim 10 is patentable for reasons similar to those presented above with respect to claim 1.

Applicants respectfully request that the rejections of claims 1-10 be reconsidered and withdrawn.

### **Conclusion**

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

**RESPONSE UNDER 37 C.F.R. § 1.116**  
Application No.: 10/542,383

**Q88674**

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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